BLUE M CO9B-5-1/ CO9B-5-2

METER ROOM

RTD PYROMETER WITH OVER-TEMPERATURE PROTECTOR

OWNERS MANUAL

MP MASTER
MA26598

CHG	E.O.NO.	DATES	BY	CHK
A	RELEASE	5/5/83		
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MODEL C09B-5-1/C09B-5-2
RTD PYROMETER
WITH OVER-TEMPERATURE PROTECTOR

07743ML-01

TABLE OF CONTENTS

PAGE

1.0 General Information 1

1.1 Unpacking and Inspection 1
1.2 Functional Description 1
1.3 Specifications 1
1.4 Connector Pinouts 4
Main Board Assembly 07772AY-01 5
Main Schematic Diagram 07772SC-01 6
Signal Conditioner Board Assembly 07773AY-01 7
Signal Conditioner Schematic Diagram 07773SC-01 8
Top Assembly 07746AY-01 9
Outline and Mounting - DIN 1A 06896 10

2.0 Mechanical Installation Instructions 11

3.0 Operating Instructions 11

3.1 AC Power Wiring 11
3.2 RTD Sensor Input Wiring 12
3.3 Initial Checkout 13

4.0 Calibration 14

5.0 Set Point Controller 15

5.1 Over Temperature Protector (OTP) 15
5.2 Specifications 16
5.3 Connector Pinouts 17
OTP Assembly Diagram 07745AY-01 18
OTP Schematic Diagram 07747SC-01 19

1.0 GENERAL INFORMATION

1.1 UNPACKING AND INSPECTION

Your Model CO9B-5-1/CO9B-5-2 was systematically inspected and tested, then carefully packed before shipment. Unpack the instrument and inspect for obvious shipping damage. Notify the freight carrier immediately upon discovery of any damage.

1.2 FUNCTIONAL DESCRIPTION

The Model CO9B-5-1/CO9B-5-2 is designed for a wide range of precise temperature monitoring, control, and over temperature protection. Applications include furnaces, ovens and environmental chambers and industrial process systems. The Model CO9B-5-1/CO9B-5-2 will measure the output of 2-wire 100 ohm platinum RTD sensors. Calibration is to the DIN 43760 Standard (based on ITPS-68) with a temperature coefficient of 0.00385 ohm/ohm/^{o}C. An open sensor is indicated when the last three digits blank.

The Model CO9B-5-1/CO9B-5-2 is available with 1^{o} resolution. Range changes are easily accomplished so that temperature may be displayed in either the Fahrenheit or Celsius scale by switch selection on the Signal conditioner and upper control card.

High accuracy, repeatability and reliability are obtained by the use of VLSI circuitry and POLYLOG II linearizer.

1.3 SPECIFICATIONS

1.3.1 Temperature Sensor

Type	Resistance Temperature Detector, RTD
Material	Platinum
Resistance	100 ohms @ 0^{o}C
Calibration	DIN 43760 based on IPTS-68
Temperature Coefficient (Alpha)	0.00385ohm/Ohm/^{o}C
Connection Standard	2-wire configuration
Lead Resistance Maximum:	
2-wire configuration	10 ohms (sum of both lead resistances)

1.3.2 Pyrometer Indicator

Input

Configuration	Differential
Polarity	Bipolar with polarity indication
Zero	Adjustable ±10° via a potentiometer accessible from the front panel.
Overvoltage Protection	50 V p
Sensor Break Detection	Most significant digit displays "1" while 3-least significant digits blanked.
Sensor Excitation, Maximum	2 mA Nominal
Normal Mode Rejection NMR @ 50/60 Hz	60 dB
Common Mode Rejection from dc to 60 Hz	120 dB from ac power to signal low
Common Mode Voltage from dc to 60 Hz	500 V p
Linearization	POLYLOG II
Temperature Range	-330°F to +1470°F or -200°C to +800°C selected by slide switch inside the indicator

Accuracy @ 25°C (exclusive of sensor)

MODEL	RANGE	OVERALL ERROR ±1/2 LSD	RESOLUTION
C09B-5-1 °C	-129 to +760°C	1.3°C	1.0°C
C09B-5-2 °F	-200 to +1400°F	2.3°F	1.0°F

Zero Tempco	0.02 deg/deg
Span Tempco	0.006%R/°C
Sensor Lead Resistance Effect	Add 0.015%R for °C or 0.03% for °F per ohm of conductor resistance to overall accuracy when calibrated with 10 feet of #22 gauge leads.
Warm-up to Rated Accuracy	Less than 1 minute

1.3.3 General

Operating Temperature	0°C to +50°C
Storage Temperature	-40°C to +75°C
Humidity	Up to 95% RH at less than +50°C
Weight	600 g or 1.4 lb.
Case (Panel Mount)	
Material	Thermoplastic per UL 94-V-1
Bezel (W x H x T)	96 x 48 x 6 mm or (3.78 x 1.89 x 0.24 in.)
Depth Behind Bezel w/Conn	135.4 mm or (5.33 in).
Panel Cutout (W x H)	92 x 45 mm or (3.62 x 1.77 in).
Lens	Blue M Dwg. No. A-4474-Q DEG. C
	Blue M Dwg. No. A-4475-Q DEG. F

1.3.4 Conversion

Technique	Dual slope, average value, autozero
Signal Integration Period	100 ms nominal
Reading Rate	2.5/sec nominal
Full Scale Step Response	1.0 sec

1.3.5 Display

Type	7-segment, LED, orange 14.2 mm high (0.56 in.)
Lens	Red lexan MVCL 14416
Symbols	-1.8.8.8
Polarity Sign	Minus only
Over Range	3 least-significant digits blanked while most significant digit remains lighted.

1.3.6 Digital Input

Logical "0"	0 V dc or open circuit
Logical "1"	+5 V dc ±5%
Test Display	"1" = display of -1888

1.3.7 Power

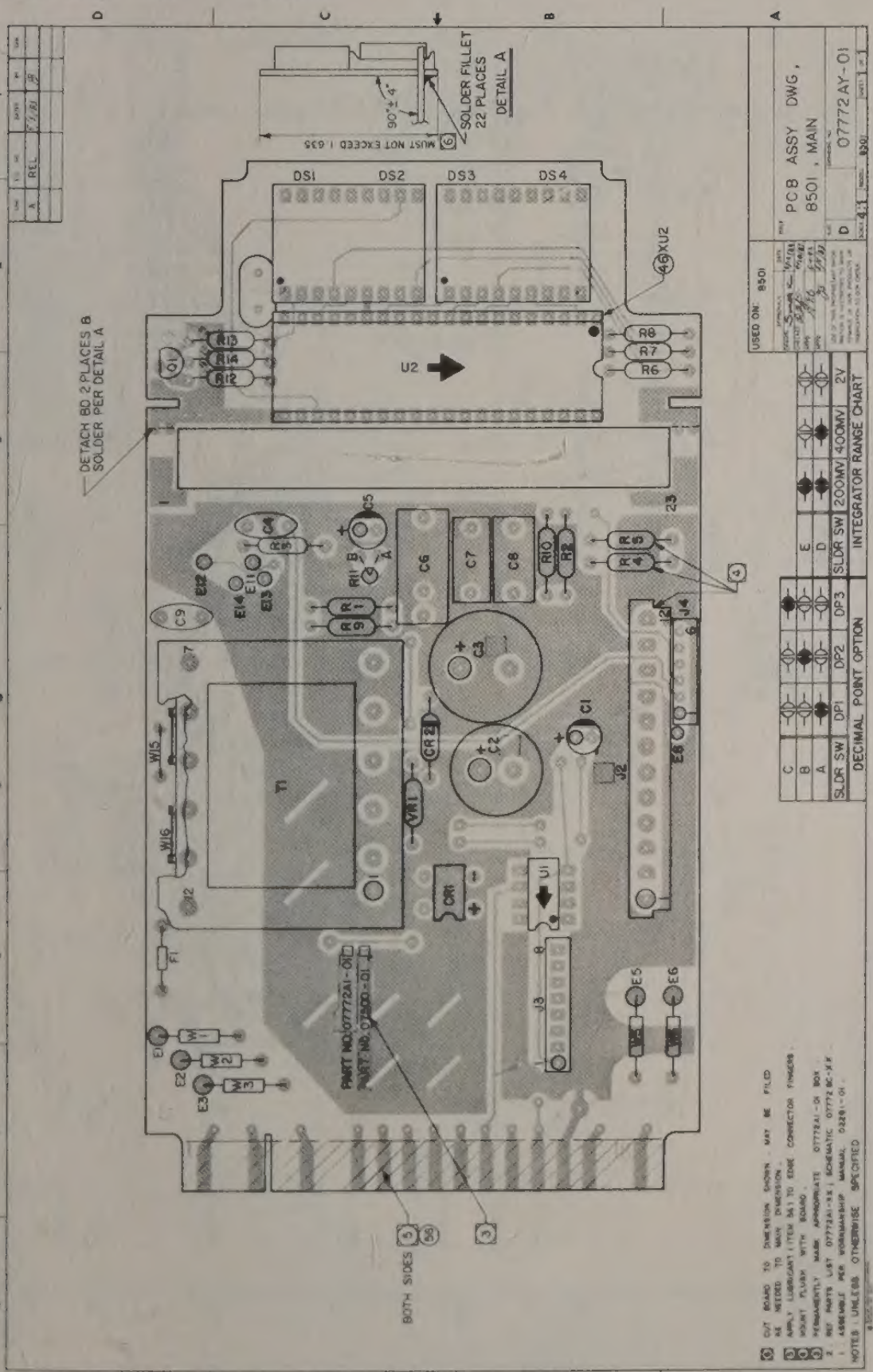
Standard Input Voltage	115 V ac ±10%, 50/60 Hz
Optional Input Voltages	100 or 230 V ac ±10%, 50/60 Hz
Frequency Range	47 to 63 Hz
Consumption	3 W maximum
Output Voltage	+5 V dc ±5% @ 5 mA maximum

1.4 CONNECTOR PINOUTS AND DECIMAL POINT WIRING: J1

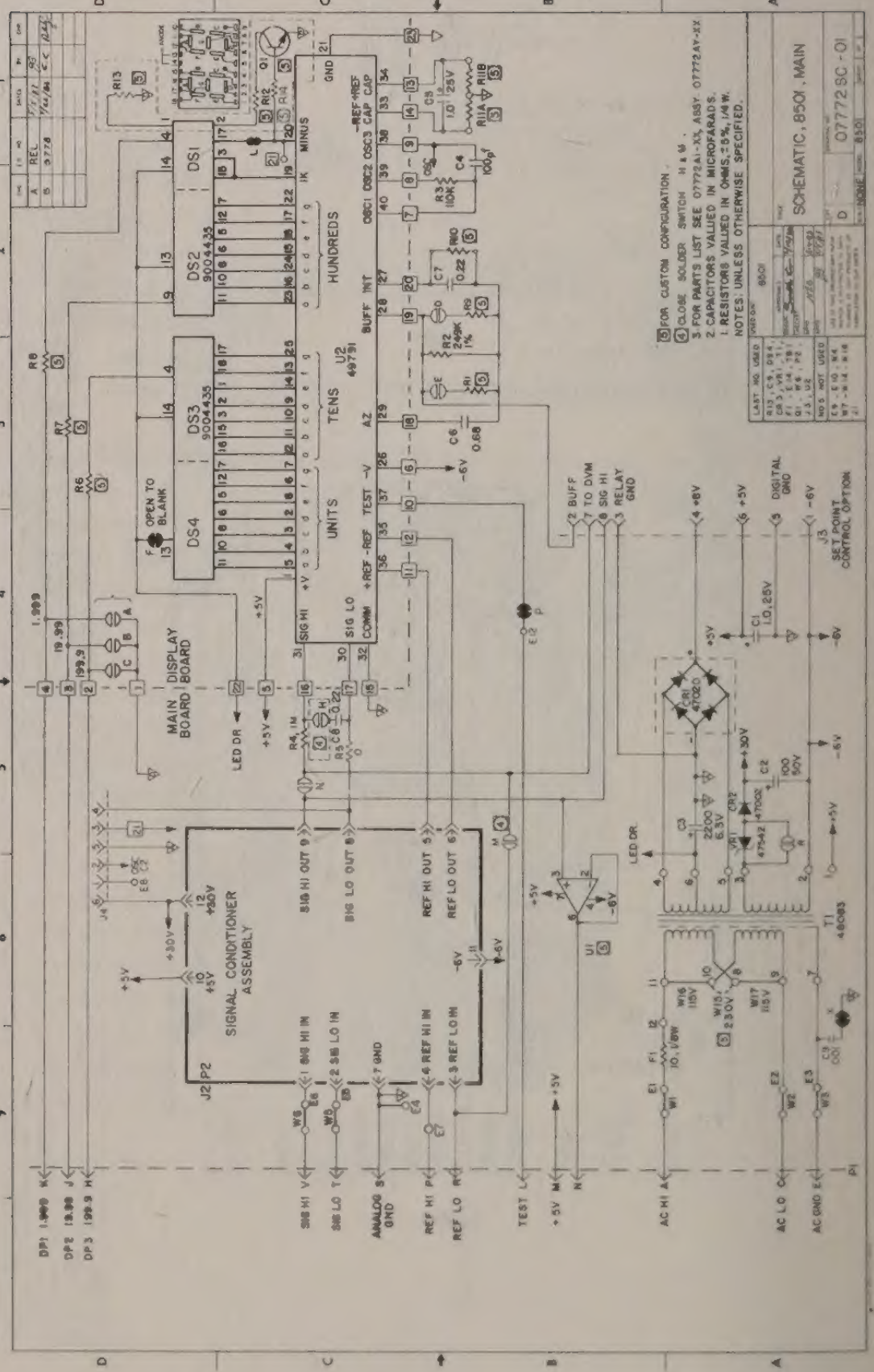
(Left to right while looking at the rear of the case)

A = AC Power HI
B = Not Used
C = AC Power LO
D = Not Used
E = AC Power GND
F = Not Used
H = 199.9 Decimal Point
J = 19.99 Decimal Point
K = 1.999 Decimal Point
L = Test
M = 5 V
N = Not Used
P = Reference Input HI
R = Reference Input LO
S = Analog Ground
T = Signal LO Input
U = Not Used
V = Signal HI Input

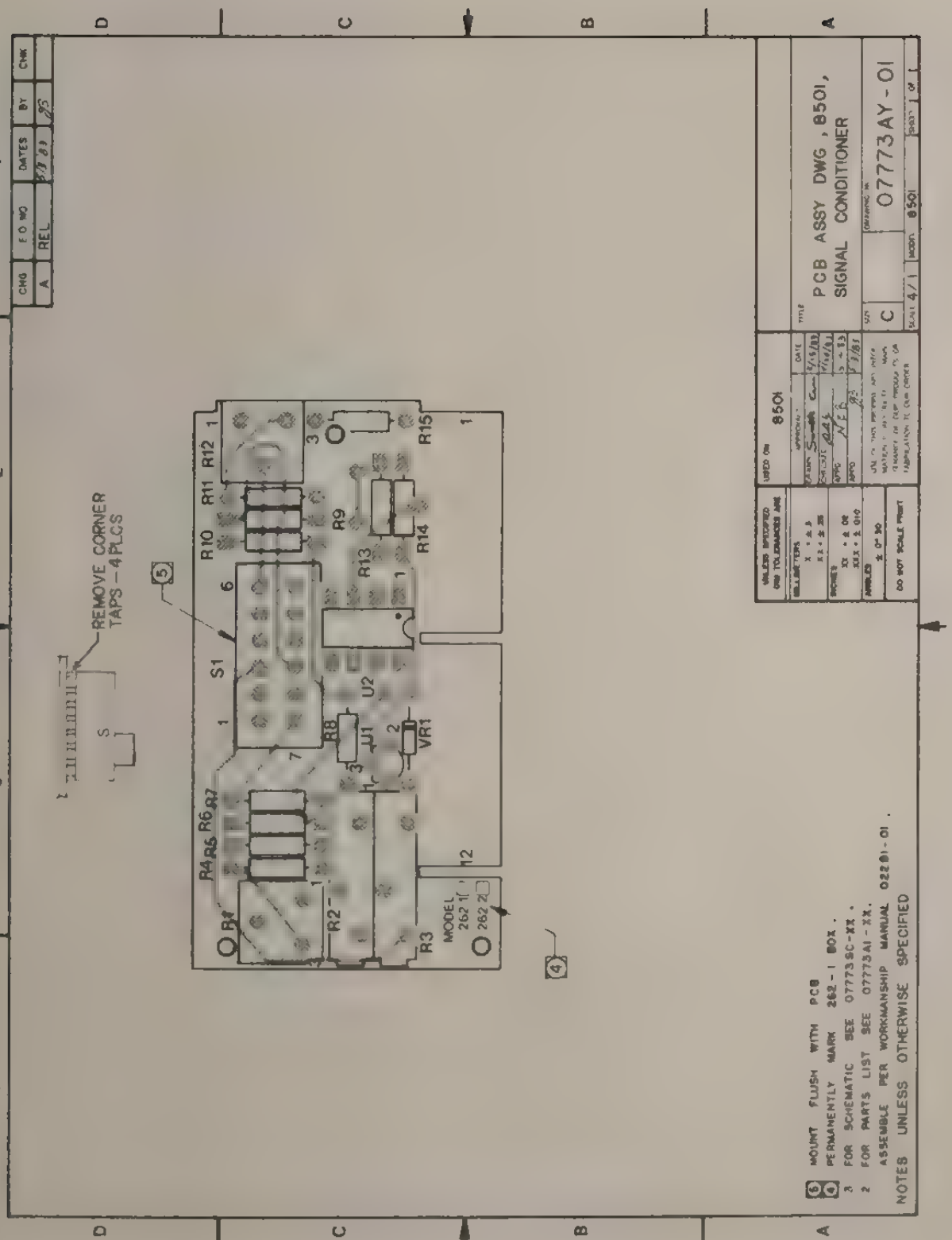
MAIN BOARD ASSY - 07772AY-01



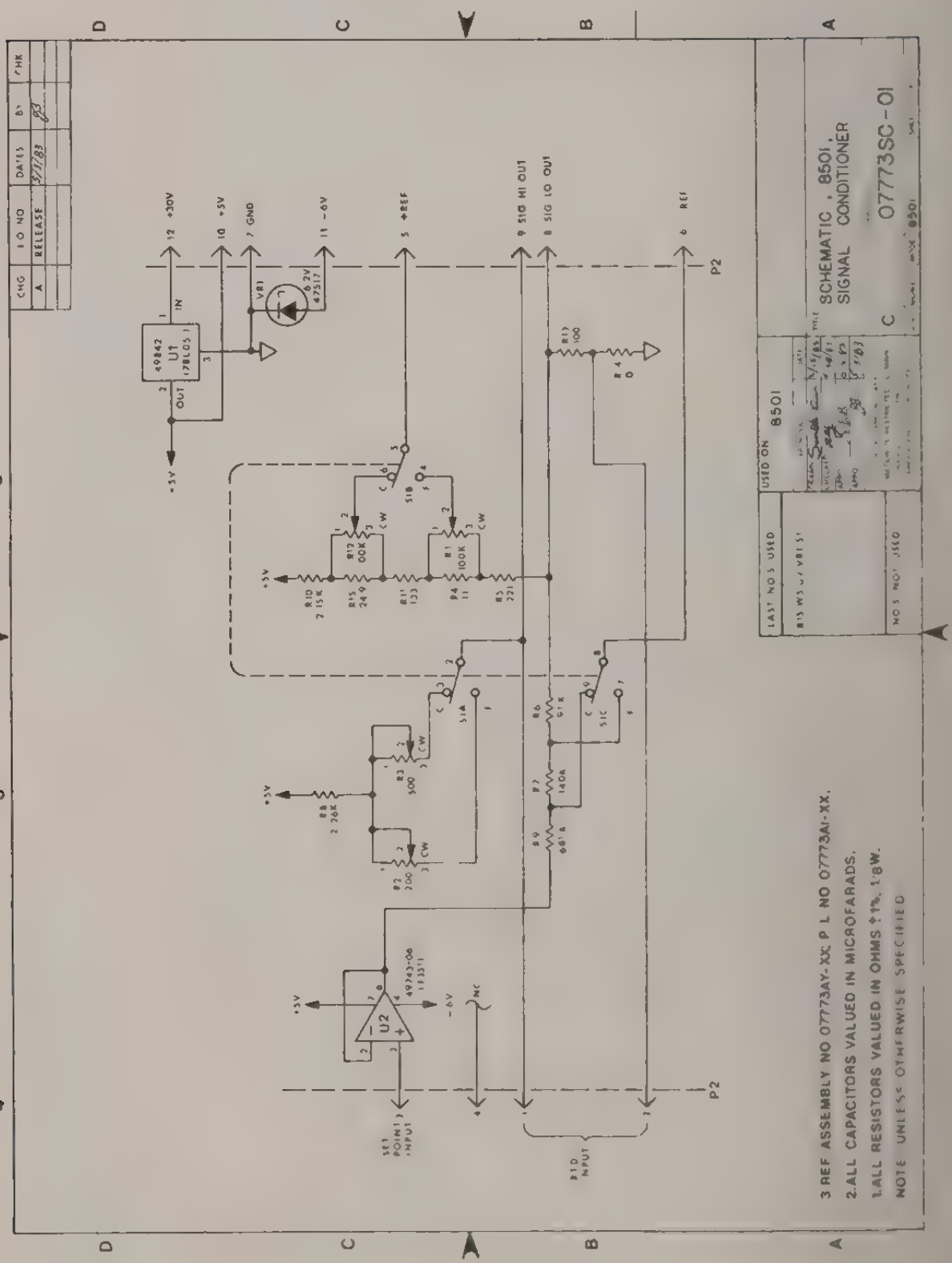
MAIN SCHEMATIC DIAGRAM - 07772SC-01



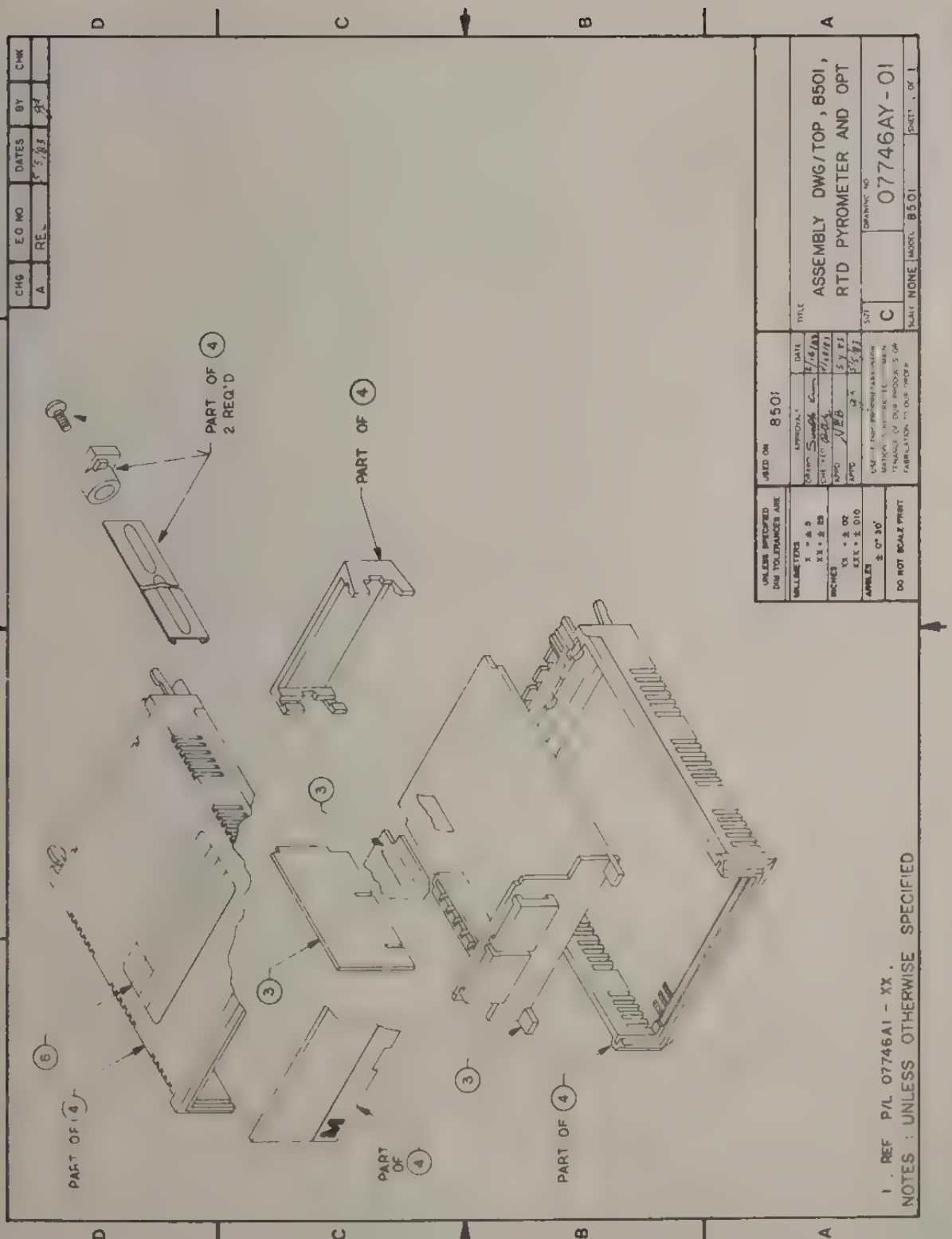
SIGNAL CONDITIONER BOARD ASSY - 07773AY-01


PCB ASSY DWG, 8501, SIGNAL CONDITIONER
07773AY-01
8501
REMOVE CORNER TAPS - 4 PLCS
MODEL 262 1
262 2
NOTES UNLESS OTHERWISE SPECIFIED
1 ASSEMBLE PER WORKMANSHIP MANUAL 02201-01.
2 FOR PARTS LIST SEE 07773AI-XX.
3 FOR SCHEMATIC SEE 07773SC-XX.
4 PERMANENTLY MARK 262-1 BOX.
5 MOUNT FLUSH WITH PCB

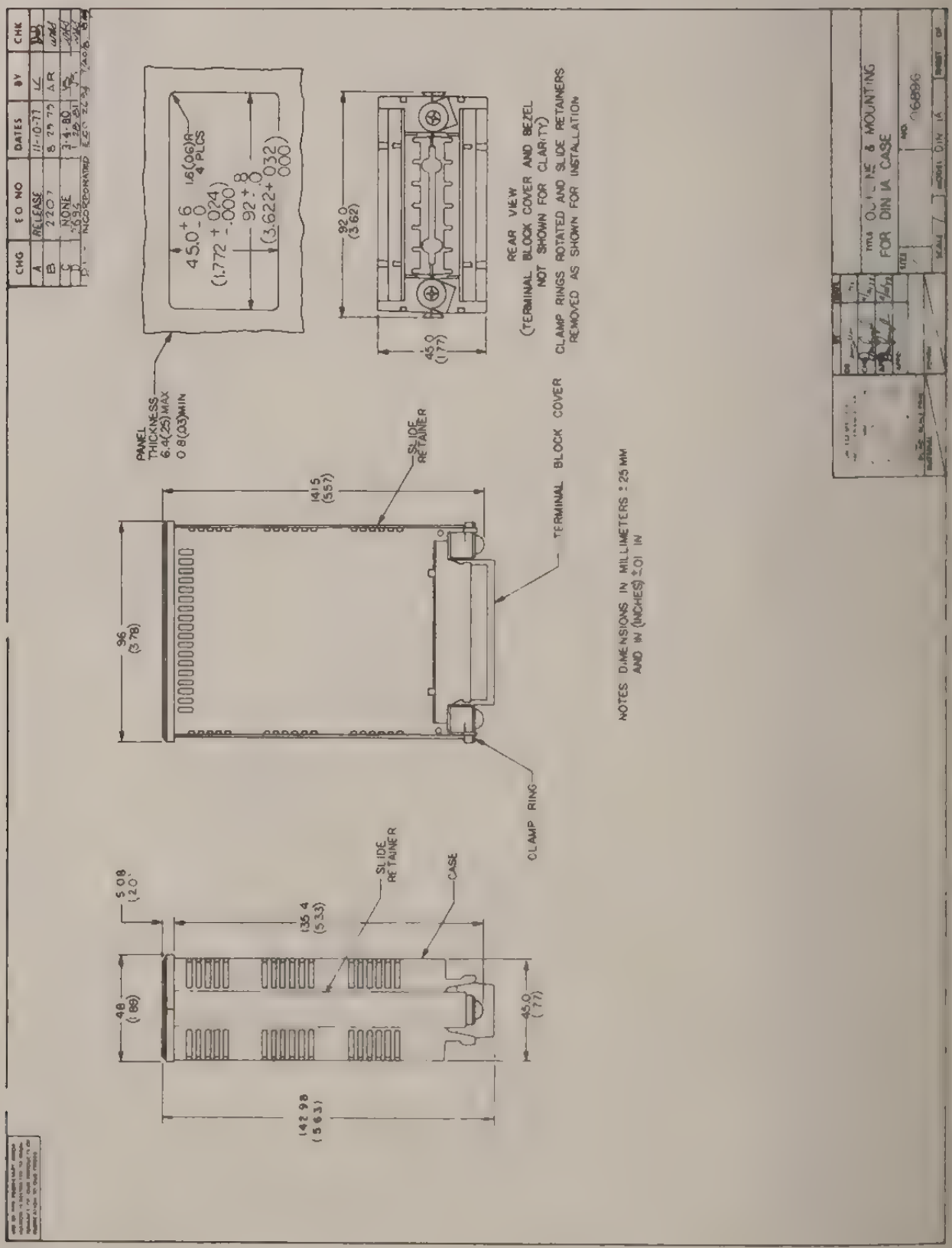
SIGNAL CONDITIONER SCHEMATIC DIAGRAM - 07773SC-01



TOP ASSY - 07746AY-01



OUTLINE & MOUNTING - 06896



2.0 MECHANICAL INSTALLATION INSTRUCTIONS

Insure that the panel cutout dimensions are as shown in Outline and Mounting Drawing 06896.

Procedure:

A) Loosen two #8 Phillips-head screws on rear of case enough to rotate the two clamp rings and to allow for the panel thickness.

B) Slide the two side rails towards the rear of the unit and remove them.

C) Insert the unit rear first into the panel cutout and slide the side rails back onto the case.

D) Rotate the clamp rings back into their original position and tighten enough to hold the case sufficiently in place. DO NOT OVERTIGHTEN!

2.1 EDGE CONNECTOR

The printed-circuit-board edge connector is easily installed by pushing it on to the printed-circuit board until it snaps under the two molded plastic tabs.

The printed-circuit-board edge connector is easily removed by pushing the two molded plastic tabs away from the connector body while pulling the connector off the printed-circuit board.

3.0 OPERATING INSTRUCTIONS

3.1 AC POWER WIRING

The Model C09B-5-1/C09B-5-2 is wired standard for operation on 115 V ac ±10%. The C1 option provides for operation on 230 V ac ±10%. With great care, connect power wires. (See Figure 2).

3.1.1 Standard Connection

J1-A	AC Power HI
J1-C	AC Power LO
J1-E	AC Power GND

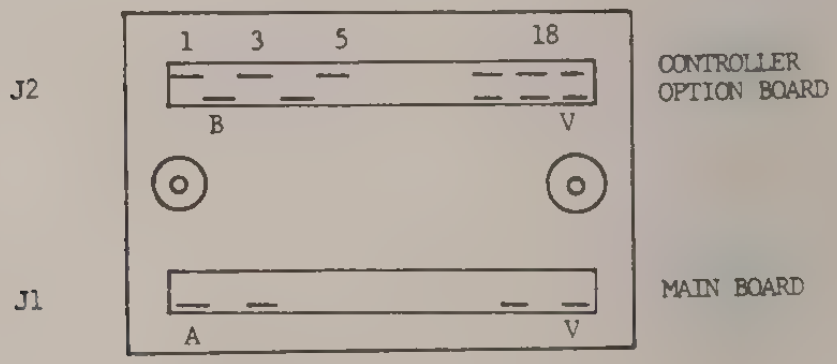
3.2 RTD SENSOR INPUT WIRING

3.2.1 Standard Connection (see Figure 1, J1)

J1-Pin	Signal	2-Wire
V	(+) Input	RL_1
		RTD
T	(-) Input	R_x
S	(1) Input	RL_2

NOTE: For 2-Wire $R_x = RL_1 + RL_2$

Figure 1



Rear View of Unit
Figure 2

3.3 INITIAL CHECKOUT

3.3.1 °C or °F Selection

The Model C09B-5-1/C09B-5-2 is shipped with the °C/°F selector switch in the position selected by the customer lens selection, LC for °C or LF for °F.

To change the scale from °C to °F or °F to °C, remove ac power from the unit and proceed as follows:

A) Remove two #8 Phillips-head screws on the rear of case.

B) Remove two plastic clamp rings and two metal side rails.

C) Lift off the top half of case.

D) Slide the switch on the vertical plug-in card forward toward the display for °F scale and toward the rear connector for °C.

E) On the OTP Assembly place the latching pushbutton in for °C range and out for °F range.

F) If available, replace lens with one screened with the proper temperature scale designation and reassemble in the reverse order above.

3.3.2 Initial Checkout Procedure

CAUTION

Meters are internally connected for either 115 V ac or 230 V ac power. Check label on meter for proper supply voltage.

A) Connect ac power as indicated in Section 3.1.

B) Connect a 100 ohm resistor .1% or 1% between J1-V and J1-T.

C) Connect a piece of wire between J1-T and J1-S.

D) Apply power and examine the display. The readout should show approximately 000°C or 032°F.

NOTE: For a more detailed check see Section 4.

3.3.3 Display Test

Connecting TEST (J1-L) to ±5 V(J1-M) lights all the display segments.

3.3.4 +5 V dc Output

+5 V dc @ 5 mA available at J1-M for use on test function.

4.0 CALIBRATION

4.1 CALIBRATION PROCEDURE

The Model C09B-5-1/C09B-5-2 was calibrated at the factory with a precision source. Frequent calibration is not necessary due to the stability and internal accuracy of the meter. The only adjustments normally available to the customer are the zero adjustments which are accessible with the lens removed.

4.1.1 Zeroing RTD Sensor

A) Remove the lens from the front by inserting a screwdriver under the notch at the bottom of the lens and prying the lens free.

B) Connect ac power and RTD Sensor per section 3.1 and 3.2.

C) Apply power and allow meter to warm up for two minutes.

D) Place the RTD Sensor in an ice point cell or stir in an ice bath until a stable reading is obtained.

E) Adjust appropriate potentiometer through the bottom left side of the display board. For ^{o}F meters adjust R2 upper potentiometer for a reading of $32^{o}F$ ($32.0^{o}F$). For ^{o}C meters adjust R3 lower potentiometer for a reading of $000^{o}C$ ($00.0^{o}C$).

4.1.2 Factory Calibration

A) See section 3.1 and 3.2 for ac power and RTD input wiring.

B) Connect calibrated resistance source in place of RTD sensor.

C) Remove top half of case per section 3.3.1.

D) Apply power and allow meter to warm up for two minutes.

E) Calibrate plug-in card as follows: (see Signal Conditioner Assembly).

Model	Range	Input (ohms)	Adjust	Reading
C09B-5-1	°C	100.00	R3	±000
C09B-5-1	°C	375.61	R12	800
C09B-5-2	°F	93.01	R2	±000
C09B-5-2	°F	371.96	R1	1450

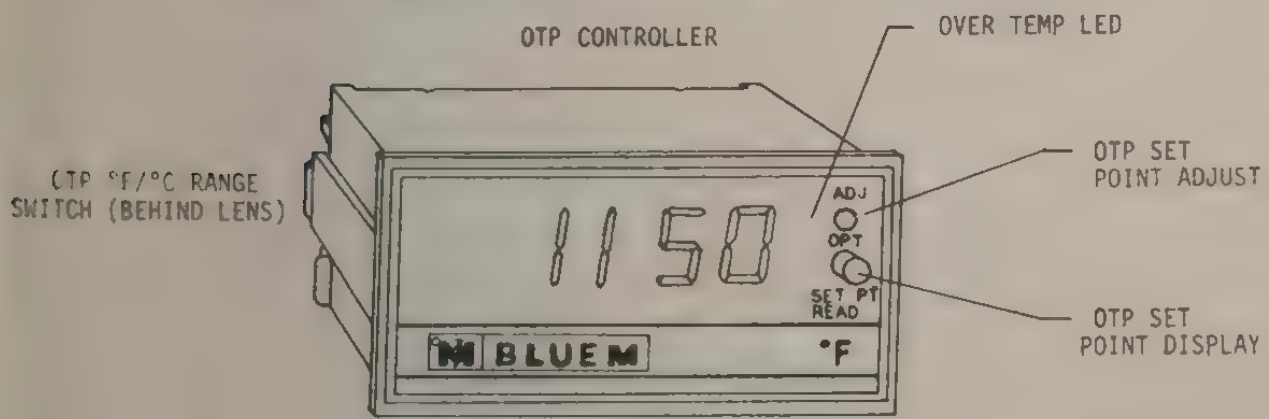
NOTE: Model C09B-5-1/C09B-5-2 requires main board integrator range of 2 V.

5.0 SET POINT CONTROLLER

5.1 OVER TEMPERATURE PROTECTOR (OTP)

5.1.1 Functional Description

This delineates the requirements and operating characteristics of a digital electronic pyrometer and over-temperature-protection circuit. The pyrometer receives a signal from a 100 platinum RTD which senses the temperature inside a chamber and indicates the chamber's temperature from -330°F to +1470°F or -200°C to +800°C on a display composed of four 0.56" high orange LED digits with a red lens. The over-temperature protector, OTP, works in parallel with the pyrometer indicator. An internal potentiometer and pushbutton switch, both accessible from the pyrometer's front panel, are used to adjust the over temperature set point in the operating ranges of -330°F to +425°F or -200°C or +218°C, -330°F to +700°F or -200°C to +371°C, -330°F to +1400°F or -200°C to +760°C (upper set point range is selected by Blue M with a switch closure to ground at the OTP printed circuit board edge connector). When the set point is exceeded a form C relay is de-energized which has a contact rating of 5A/230 V ac with a resistive load.



The set-point is protected against accidental change. A screwdriver must be inserted to adjust the set-point value. The set-point value displayed when switch is depressed.

5.2 SPECIFICATIONS

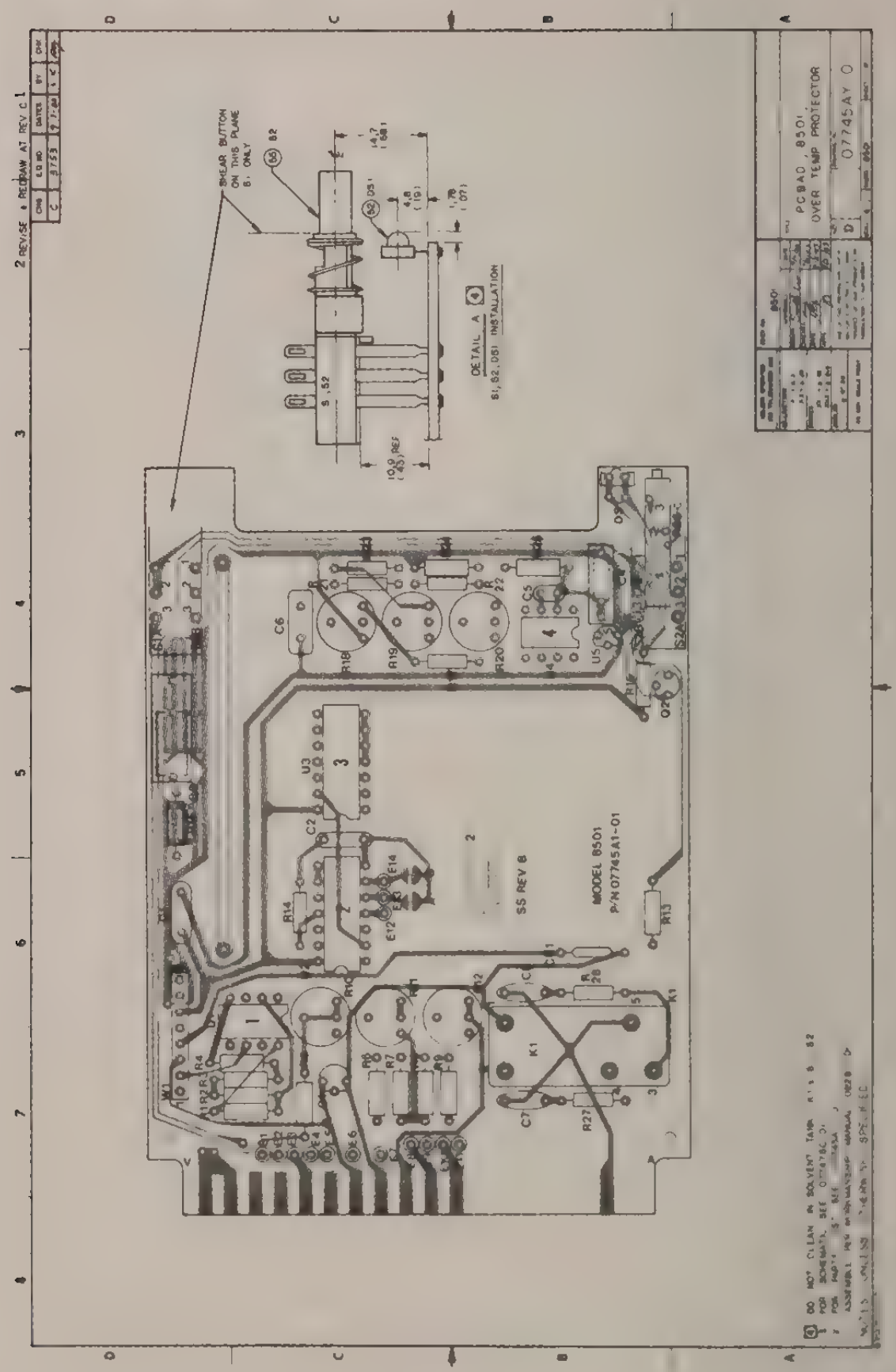
5.2.1 General

Environment	Same as basic meter
Power and Signals	Supplied by basic meter via internal cable.
Connector	
Upper J2	36-pin double row 3.96 mm (0.156 in.) spacing
Set Point Upper Limit Select	Edge connector connections on the OTP card, Blue M may select following upper limits within ±4% tolerance: +425°F (+218°C) +700°F (+371°C) +1400°F (+760°C) °F or °C selectable by latching pushbutton switch behind the lens.
Set Point Adjust	Via a 20-turn potentiometer accessible from the front panel through a hole in the lens.
Set Point Display	By depressing a pushbutton switch which protrudes through the lens in the front panel, the over-temperature set point is displayed by the pyrometer indicator.
Settability	Within 1°
Hysteresis	1-2°C or 2-4°F
Relay Output	
Over Temperature Signal	A form C relay is de-energized when the temperature at the sensor exceeds the set point temperature and a red LED is turned on behind lens.
Contact Rating	5 A, 230 V ac with a resistive load
Contact Isolation	1000 V plus twice maximum rated ac line voltage between contacts and sensor, ac line, or controls.
Contact Circuit Spacing	Spacing of contact circuit leads on the printed circuit board edge connector will comply with UL standards for circuits rated to 250 V ac.

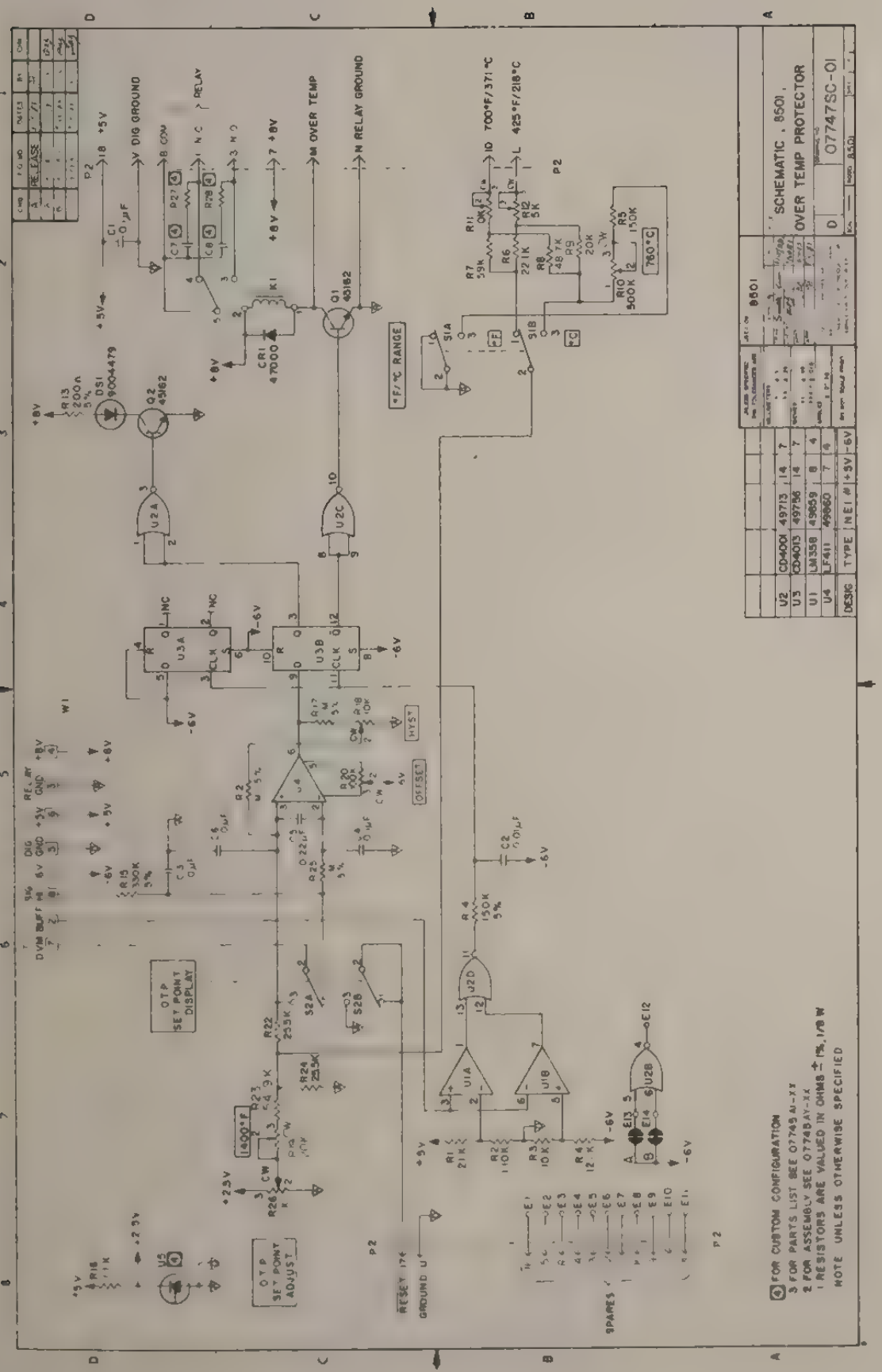
5.3 UPPER CONNECTOR PINOUTS: J2

A	Not Used	1	Relay - N.C.
B	Relay - COM	2	Not Used
C	Not Used	3	Relay - N.O.
D	Not Used	4	Not Used
E	Not Used	5	Not Used
F	Not Used	6	Not Used
H	Not Used	7	+8 V (Full Wave)
J	Spare	8	Spare
K	Spare	9	Spare
L	425°F/218°C	10	700°F/371°C
M	Over Temp	11	Spare
N	Relay GND	12	Spare
P	Not Used	13	Spare
R	Not Used	14	Spare
S	Not Used	15	Spare
T	Not Used	16	Spare
U	DIG GND	17	$\overline{\text{RESET}}$
V	DIG GND	18	+5 V

CIRCUIT BOARD ASSEMBLY - 07745AY-01



SCHEMATIC DIAGRAM - 07747SC



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